BRIEF REPORT

Infections Requiring Hospitalization of Injection Drug Users Who Participated in an Injection Opiate Maintenance Program

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A retrospective analysis of hospitalizations due to infection in 175 injection drug users was performed for the 3 years before and the period during their participation in an injection opiate maintenance program (mean duration during program, 2.6 years). Skin infections were the main reason for hospitalization. The injection opiate maintenance program did not reduce the incidence of infection leading to hospitalization among the injection drug users studied.

Injection drug use is associated with several complications (e.g., infectious diseases, drug overdose, violence) that increase morbidity and mortality rates for injection drug users (IDUs) [1–4]. Studies published elsewhere have demonstrated that infections in particular are a leading cause of morbidity and hospitalization among IDUs [3]. Complications associated with injection drug use are frequently the consequence of the illegal status of street drugs. Therefore, opioid substitution programs were developed, with the objective of reducing dependence and morbidity and mortality rates associated with the use of psychoactive substances.

In response to growing problem of the failure of oral substitution treatments to handle addiction in IDUs, injection opiate maintenance programs were started [5–7]. These programs are controversial [6]. Scientific evaluation of such programs is therefore essential. It has been shown elsewhere that injection opiate maintenance programs improved health status and social functioning, reduced the self-reported use of illicit drugs and criminal activity [5–7], and may decrease the incidence of HIV and hepatitis A virus infection [8]. However, to our knowledge, no data are available on the impact of such programs on severe infections among the participants. The present report investigates whether an injection opiate maintenance program decreases the incidence and changes the spectrum of infections that require hospitalization among participating IDUs.

Patients and methods. This study is a retrospective analysis of data from participants in the injection opiate maintenance program in Basel, Switzerland, which began on 1 November 1994. Eligibility criteria for the opiate program were residence in the canton of Basel City, age ⩾20 years, a ⩾2-year history of addiction to injected heroin, failure of treatment for withdrawal to cure addiction, and social distress and/or health problems that resulted from injection drug use. Participants had to inject the prescribed drug (heroin, methadone, or morphine) at the study site by using the clean equipment provided. At enrollment in the program and at 6-month intervals, participants underwent psychiatric and somatic evaluations.

Written informed consent was obtained from all participants. The study was approved by the Institutional Review Board of the University of Basel, the canton of Basel City, and the Swiss Federal authorities.

All participants who underwent their first evaluation from 1 November 1994 through 31 January 1997 are included in the present analysis. Data regarding the hospitalizations of these participants due to infection during the 3 years preceding the enrollment in the injection opiate maintenance program were compared with data for the hospitalizations that occurred during the program. Hospitalizations were identified from the electronic patient records of the University Hospital Basel. After identification of electronic records, patients charts were examined. University Hospital Basel provides primary and tertiary care, and it is the only public hospital in the canton of Basel City with a department of internal medicine. Very few IDUs have access to any of the 3 private hospitals in the local area. Therefore, University Hospital Basel admits ⩾90% of all IDUs residing in the canton of Basel City who require inpatient care [2]. Hospitalizations that occurred from 1 November 1991 through 31 October 1998 were considered in the analysis.

The incidence of infection-related hospitalizations per 100 patient-years and the incidence ratio with 95% CIs were calculated by use of Stata, version 6.0 (Stata Corporation).

Results. One hundred seventy-five IDUs (52 women and 123 men) were evaluated and admitted to the injection opiate

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maintenance program in Basel from 1 November 1994 through 31 January 1997 and are included in the present analysis. The mean age of patients at the time of enrollment in the program was 31.4 years (range, 21–53 years), and the mean duration of injection drug use was 11.8 years (range, 1.5–34 years). Of the 175 patients, 76 (43%) withdrew from the program before 31 October 1998. The reasons for withdrawal are known for 72 patients. The main reasons were admission to a conventional oral opiate substitution program (22 patients), receipt of detoxification treatment (15 patients), and dissatisfaction with the program (13 patients). Two of these 76 patients died during the program: one patient died after injecting drugs outside the program facility, and the other patient, who had AIDS, died of pneumonia. The mean duration of participation in the program was 2.6 years (range, 5 days to 4 years). Of the tested patients, 5 (2.9%) of 173 had chronic hepatitis B infection, 143 (82.2%) of 174 had chronic hepatitis C infection (verified by hepatitis C virus RNA determination), and 37 (21.5%) of 172 had HIV infection.

Infections led to 50 hospitalizations among the 175 IDUs in the 3-year period before admission to the injection opiate maintenance program, and they led to 39 hospitalizations while patients were participating in the maintenance program (table 1). This resulted in an infection-related hospitalization rate of 9.5 hospitalizations per 100 patient-years before and 8.6 hospitalizations per 100 patient-years during the program (incidence ratio, 1.11; 95% CI, 0.71–1.73; $P = .64$). Patients infected with HIV had significantly higher infection-related hospitalization rates than did HIV-negative patients during, but not before, the program (incidence per 100 patient-years during the program, 8.0 in HIV-negative and 19.2 in HIV-positive patients [incidence ratio, 0.42; 95% CI, 0.21–0.86; $P = .01$]; incidence before the program, 10.1 in HIV-negative and 14.4 in HIV-positive patients [incidence rate ratio, 0.70; 95% CI, 0.38–1.36; $P = .25$]).

Discussion. This retrospective analysis of a population of severely addicted IDUs suggests that an injection opiate maintenance program may not significantly reduce the incidence of infections that lead to hospitalization in this population in the short term. Also, the type of infections that require hospitalization observed in the present study did not change during the injection opiate maintenance program. In fact, skin infection remained the leading cause of hospitalization, followed by respiratory infection, bloodstream infection, and fever.

Several factors should be considered for a correct interpretation of these findings. In the city of Basel, sterile injection equipment is provided to all IDUs in state-supported public facilities where illicit drug use is tolerated [2]. Thus, a majority of IDUs included in the present analysis already routinely used sterile injection equipment in these facilities before entering the injection opiate maintenance program. This could explain the similar incidence of skin infections that required hospitalization before and during the program. On the other hand, the fact that the incidence of infection-related hospitalizations during the program did not increase may be interpreted as a stabilization of the health status of the participants.

Table 1. Infections requiring hospitalization of 175 injection drug users before and during participation in an injection opiate substitution program.

Infection site, type, or sign	No. of hospitalizations (incidence per 100 patient-years)	
	Before admission into program	During program
Skin[a]	20 (3.8)	21 (4.6)
Respiratory tract[b]	10 (1.9)	6 (1.3)
Bloodstream[c]	5 (0.9)	3 (0.7)
Fever[d]	5 (0.9)	3 (0.7)
Hepatitis[e]	3 (0.6)	0 (0)
HIV related[f]	2 (0.4)	2 (0.4)
Urogenital[g]	0 (0)	3 (0.7)
Other[h]	5 (0.9)	1 (0.2)

[a] Abscesses, phlegmonous infections, erysipelas, ulcerations, and necrosis.
[b] Pneumonia and pleural empyema.
[c] Isolated pathogens: *Staphylococcus aureus* ($n = 4$), *Staphylococcus epidermidis* ($n = 1$), *Candida* species and *S. epidermidis* coinfection ($n = 1$), *Streptococcus pyogenes* ($n = 1$), and *Enterobacter cloacae* ($n = 1$).
[d] Without identification of a pathogen.
[e] Acute hepatitis A, acute hepatitis B, and newly discovered hepatitis C with epigastric pain and pancytopenia.
[f] Diarrhea, encephalopathy, lymphadenitis, and *Candida* stomatitis.
[g] Pyelonephritis and epididymitis ($n = 2$).
[h] Osteomyelitis, osteochondritis, septic thrombophlebitis, lymph-node abscess, and surgical wound infections ($n = 2$).

The medical assistance available during the program may have permitted early identification and outpatient management of infection, thus averting the need for hospitalization, but this may have also contributed to the earlier hospitalization of at-risk patients with severe comorbidity (in particular, HIV-positive patients). This is suggested by the data that showed a decrease in infection-related hospitalization rates in HIV-negative patients, as opposed to an increase in infection-related hospitalizations rates in HIV-positive patients, after enrollment in the program. A randomized study with a control group would be necessary to improve understanding of these factors. However, this may not be feasible in severely addicted IDUs.

In addition to the use of nonsterile injection material, there are other factors that may increase the risk of infections in IDUs [3]: high prevalence of nasal *Staphylococcus aureus* carriers among IDUs, poor dental hygiene, decreased bacterial clearance by the tracheobronchial system during intoxication, impairment of immune functions by heroin [9] or by injection drug use itself, and promiscuity and prostitution. Only a few of these factors may be influenced—and then only indirectly—by an injection opiate maintenance program (e.g., through a decrease

in the incidence of intoxication or a reduction in prostitution), and an effect may be identified only with a longer follow-up period.

The effect of an opiate maintenance program on the incidence of chronic infection, such as HIV and hepatitis B and C virus infection, is not considered in the present study. However, during this injection opiate maintenance program, another study demonstrated a low rate of seroconversion for HIV (only 1 new HIV infection; incidence, 0.62 cases per 100 person-years), as well as a considerable decrease in the hepatitis B and C virus seroconversion rate after 6 months of participation in the program [8]. A relevant factor contributing to the decreased incidence of bloodborne infections among IDUs is the reduction in the illicit use of street drugs. Indeed, a reduction of illicit heroin use has previously been shown among IDUs who participated in Swiss injection opiate maintenance programs: at entry into the programs, 81% of the participants reported illicit heroin use on a daily basis, whereas, at 18 months, only 6% of the participants reported daily heroin use outside the program, and 74% reported no illicit consumption of heroin [6, 7].

Seventy-six participants (43%) withdrew from the present study. However, 37 of these 76 patients switched from the injection opiate maintenance program to another form of treatment (orally administered opiate substitution or detoxification). It should also be noted that a retention rate of 57% after a mean of 2.6 years should be considered a good result and is comparable to the rate achieved in other studies [6, 7, 10].

In conclusion, an injection opiate maintenance program does not directly decrease the incidence of infections requiring hospitalization in the short term. However, other beneficial effects of this kind of program, such as improvement of health status, a decrease in the number of homeless persons, a reduction in the consumption of street drugs [6, 7], and a decrease in the incidence of HIV [8], are likely to reduce the risk of infection among IDUs in the long term. These aspects need to be addressed in further studies.

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